

# Tulane

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November 25, 1996

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Dr. Ralph Wachter  
Program Director  
Software Research Program, Code 311  
Mathematical, Computer and  
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Office of Naval Research  
800 North Quincy Street  
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Dear Dr. Wachter:

This is the final project report for the contract No. N00014-96-1-0709 that I was PI on. The contract was for support of the Twelfth Workshop on the Mathematical Foundations of Programming Semantics, which took place at the University of Colorado, Boulder from June 3 to June 5, 1996. The workshop featured invited addresses by six internationally recognized researchers, one special session, and forty talks contributed by participants. In all there were 69 participants from all over the world. The *Proceedings* of the meeting will comprise a special issue of the journal, *Theoretical Computer Science*, and it will be comprised of papers which are submitted by the participants and that will be refereed to the usual standards of *TCS*.

In addition to supporting MFPS 12, the funds in this grant also helped support a Workshop on Concurrency that took place at Tulane University, as well as a short workshop on Semantics and Security that also took place in New Orleans, in September of this year. The concurrency workshop consisted of visits by several researchers who collaborated with me on various aspects of my research program, and the workshop took place over a period of about two months. Details of those researchers who were supported by these funds, and about their visits to Tulane are presented in the attached report.

We wish to express once again our thanks to ONR for providing us with this much-needed support. ONR has been a continuing supporter of the MFPS series, and we believe has contributed greatly to the success and world-wide recognition it receives.

Best regards,



Michael Mislove  
Professor

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Report on Conference Support Contract  
No. N00014-96-1-0709  
Michael Mislove, Principal Investigator  
Mathematics Department  
Tulane University

Summary of Completed Project

The funding from ONR was used to support the invited speakers at the twelfth workshop on the Mathematical Foundations of Programming Semantics, to help support participants in the special session held during the meeting, and to underwrite general conference support costs, including support of graduate students, women and members of minority groups to participate in the meeting. This annual series of meetings provides a venue for mathematicians and theoretical computer scientists to meet and discuss problems of mutual interest.

In addition to supporting MFPS 12, the funds from this grant were used to support visits to Tulane by several researchers who also work in the areas close to Professor Mislove's interests, and to support a small workshop on Semantics and Security that took place in New Orleans in September. Details of these activities are reported below.

Detailed Information

The Twelfth Workshop on the Mathematical Foundations of Programming Semantics took place on the campus of the University of Colorado, Boulder from June 3 to June 5, 1996, and featured invited addresses by six international researchers, one special session devoted to honoring Peter Freyd on his 60th birthday, and forty one talks contributed by participants in the meeting. The invited speakers at the meeting were

Peter Freyd	( <i>Penn</i> ),
Mel Fitting	( <i>CUNY</i> ),
Matthew Hennessy	( <i>Sussex</i> ),
Gerard Huet	( <i>INRIA</i> ),
Andre Scedrov	( <i>Penn</i> ),
Jeannette Wing	( <i>CMU</i> ).

The conference attracted 69 participants from 11 countries, and the ONR grant helped provide support for the six invited speakers, for the participants in the special session, and for women and minority participants who participated in the meeting. The conference will

publish its *Proceedings* as a special issue of *Theoretical Computer Science*. This special issue will consist of journal-length papers submitted by the participants and refereed to *TCS*'s usual standards.

In addition to supporting MFPS 12, the funds in this grant were used to support a Workshop on Concurrency that took place at Tulane University over a period of about two months, and which was comprised of visits to Tulane by several researchers who collaborated with Professor Mislove on parts of his research program. These researchers included Professor Giuseppe Rosolini (*University of Genoa*) and Dr. Paul Gustin (*LITP, Université Paris VII*). Dr. Gustin visited Tulane for a period of about a month, and during this time he and Professor Mislove embarked on a research program directed at their common interests - Dr. Gustin's well-known work on *true concurrency* and Professor Mislove's work on domain theory and models for concurrency. The goal of the work is to find out if there is any advantage to using true concurrency in modeling concurrent languages, as oppose to the more traditional approach of resolving parallel composition by interleaving sequential compositions.

Lastly, the funds were used to help support a small workshop on Semantics and Security that was held in New Orleans from September 15 to September 17, 1996. The goal of the workshop was to acquaint participants with potential applications of semantics to security. In addition to Professor Mislove, the participants were

Steve Brookes	( <i>CMU</i> ),
Connie Heitmeyer	( <i>NRL</i> ),
Radha Jagadeesan	( <i>Loyola, Chicago</i> ),
John McLean	( <i>NRL</i> ),
G. M. Reed	( <i>Oxford</i> ), and
A. W. Roscoe	( <i>Oxford</i> ).

The aim for the participants in this workshop is to find areas of collaboration in their research that will focus on using semantic techniques to attack problems involving security in areas ranging from homogeneous to heterogeneous computing systems.

## Mathematical Foundations of Programming Semantics and Concurrency Workshop

ONR award number: N00014-96-1-0709  
Total amount awarded: \$15,000  
Period of award: 3/1/96 - 9/30/96

### Mathematical Foundations of Programming Semantics (MFPS XII 1996) - \$12,000

University of Colorado at Boulder  
Boulder, CO  
June 3 - 5, 1996

Number of Participants: 69 total  
Faculty 59  
Students 10

Number of Countries represented: 11  
Canada  
Denmark  
France  
Germany  
Hungary  
Italy  
Japan  
Netherlands  
Portugal  
United States  
United Kingdom

Number of graduate students supported: 6

Haack, C.  
Hu, H.  
Ibraheem, H.  
Kotov, S.  
Loughry, B.  
Resende, P.

Number of women supported: 2

Finkelstein, S.  
Jourdan, S.  
Wing, J.

Faculty participants supported other than  
invited speakers:

Fiore, M.  
Gastin, P.  
Oles, F.  
Rosolini, G.

### Concurrency Workshop - \$3,000

Tulane University  
New Orleans, LA  
May - August 1996

Supported professional visiting participants: Gastin, P.  
Rosolini, G.

Semantics workshop participants supported: Brookes, S.  
Jagadeesan, R.  
Reed, M.  
Roscoe, B.

# MFPS XII

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## Twelfth Conference on the Mathematical Foundations of Programming Semantics

University of Colorado  
Boulder, CO USA  
June 3 - 5, 1996



Partially Supported by the US Office of Naval Research

The Twelfth Workshop on the Mathematical Foundations of Programming Semantics will take place on the campus of the University of Colorado in Boulder, CO from June 3 to June 5, 1996. The invited speakers for the meeting are

Peter Freyd	<i>Penn</i>
Mel Fitting	<i>CUNY</i>
Matthew Hennessy	<i>Sussex</i>
Gerard Huet	<i>Inria</i>
Andre Scedrov	<i>Penn</i>
Jeannette Wing	<i>Carnegie-Mellon</i>

In addition to the invited talks, there will be one special session at the meeting, and the remainder of the program will consist of contributed talks by the participants. Time for the contributed talks will be allocated on a first-come, first-serve basis; parallel sessions may be used if there is a large number of requests that cannot be accommodated without them.

A *Proceedings* also is planned. As has been the case with previous MFPS Workshops, this will likely take the form of a special issue of the journal *Theoretical Computer Science*, devoted to journal-length papers on results related to those presented at the meeting. A *Call for Papers* for the special issue will be disseminated after the meeting.

In addition to supporting the workshop overall, the support being provided by the Office of Naval Research makes funds available to help offset expenses of graduate students. Women and minorities also are encouraged to inquire about possible support to attend the meeting.

### Registration Information

Detailed information about registration and accommodations now is available. If you wish to register for the meeting, follow the link.

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If you have questions about the meeting, send email to us at: [mfps@math.tulane.edu](mailto:mfps@math.tulane.edu).

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# MFPS

## Schedule of Presentations and Workshop Events

Monday, June 3, 1996

8:00 AM	UMC Aspen Rooms	CONTINENTAL BREAKFAST
8:25 AM	UMC 157	WELCOME
8:30 AM	UMC 157	Stephen Brookes, Carnegie Mellon University <i>Parallel Algol: Combining Procedures with Parallelism</i> (abstract on p. 8)
9:00 AM	UMC 157	Hans Hüttel, Aalborg University <i>Objects as Mobile Processes</i> (abstract on p. 15)
9:30 AM	UMC 157	Zoltan Ésik, Attila József University <i>Independence of the Group Axioms for Iteration</i> (abstract on p. 10)
10:00 AM	UMC Aspen Rooms	BREAK
10:30 AM	Sibell Wölle Fine Arts N141	INVITED ADDRESS Gerard Huet, INRIA Rocquencourt <i>Regular Bohm Trees</i> (abstract on p. 15)
11:30 AM	Sibell Wölle Fine Arts N141	Abbas Edalat, Imperial College <i>A Computational Model for Metric Spaces</i> (abstract on p. 10)
12:00 NOON	UMC Aspen Rooms	LUNCH
1:20 PM	Sibell Wölle Fine Arts N141	INVITED ADDRESS Mel Fitting, City University of New York <i>Logic Programming Semantics</i> (abstract on p. 12)
2:30 PM	UMC 157	Pasquale Malacaria, Imperial College <i>Relative Definability of Boolean Functions via Hypergraphs</i> (abstract on p. 9)
OR	UMC 158	Philip Mulry, Colgate University <i>A CCC Construction for Categories of Partial Maps</i> (abstract on p. 19)

(MONDAY SCHEDULE CONTINUED ON NEXT PAGE)

**Monday, June 3, 1996 (continued)**

3:00 PM	UMC Aspen Rooms	<b>BREAK</b>
3:30 PM	UMC 157	<b>David Naumann</b> , Southwestern University <i>A Rational Imperative Language</i> (abstract on p. 19)
	OR UMC 158	<b>Robin Cockett</b> , University of Calgary <i>Shape Rings</i> (abstract on p. 10)
4:00 PM	UMC 157	<b>Denis Dancanet</b> , Carnegie Mellon University <i>Programming Language Expressiveness and Circuit Complexity</i> (abstract on p. 9)
	OR UMC 158	<b>Glen Whitney</b> , University of Michigan <i>Extensional Non-deterministic Recursion</i> (abstract on p. 25)
4:30 PM	UMC 157	<b>Yoshiki Kinoshita</b> , Electrotechnical Laboratory, Japan <i>Data Refinement and Algebraic Structure</i> (abstract on p. 17)
	OR UMC 158	<b>Cyrus Nourani</b> , META AI <i>The Tree Amplification Principle</i> (abstract on p. 19)
5:00 PM	UMC 157	<b>Dieter Spreen</b> , Universitaet Siegen <i>Finitely Generated Rank-Ordered Sets are a Model of Type:Type</i> (abstract on p. 25)
	OR UMC 158	<b>Vaughan Pratt</b> , Stanford University <i>Stochastic Manifolds</i> (abstract on p. 20)
6:00 PM	Old Main Heritage Center	<b>RECEPTION HONORING PETER FREYD</b>

**Tuesday, June 4, 1996**

8:00 AM	UMC Aspen Rooms	<b>CONTINENTAL BREAKFAST</b>
8:30 AM	Sibell Wolle Fine Arts N141	<b>INVITED ADDRESS</b> <b>Andre Scedrov</b> , University of Pennsylvania <i>Linear Logic Proof Games and Optimization</i> (abstract on p. 24)
9:30 AM	Sibell Wolle Fine Arts N141	<b>Stacy Finkelstein</b> , McGill University <i>Applications of Tau Categories</i> (abstract on p. 12)
10:00 AM	UMC Aspen Rooms	<b>BREAK</b>

(TUESDAY SCHEDULE CONTINUED ON NEXT PAGE)

**Tuesday, June 4, 1996 (continued)**

10:30 AM	Sibell Wolle Fine Arts N141	<b>Edmund Robinson</b> , Queen Mary and Westfield College <i>Enriched Categories and Algebraic Compactness</i> (abstract on p. 22)
11:00 AM	Sibell Wolle Fine Arts N141	<b>Marcelo Fiore</b> , University of Edinburgh <i>Enrichment and Representation Theorems for Categories of Domains and Continuous Functions</i> (abstract on p. 12)
11:30 AM	Sibell Wolle Fine Arts N141	<b>Guiseppe Rosolini</b> , Universita di Genoa <i>Models of Synthetic Domain Theory</i> (abstract on p. 22)
12:00 NOON	UMC Aspen Rooms	<b>LUNCH</b>
1:20 PM	Sibell Wolle Fine Arts N141	<b>INVITED ADDRESS</b> <b>Jeannette Wing</b> , Carnegie Mellon University <i>Mathematics for Software Engineering</i> (abstract on p. 26)
2:30 PM	UMC 157	<b>Bob Flagg</b> , University of Southern Maine <i>A Logical Approach to Quantitative Domain Theory</i> (abstract on p. 13)
OR	UMC 158	<b>Richard Kieburtz</b> , NSF and Oregon Graduate Center <i>Encapsulated Effects</i> (abstract on p. 17)
3:00 PM	UMC Aspen Rooms	<b>BREAK</b>
3:30 PM	UMC 157	<b>Michael Mislove</b> , Tulane University <i>A New Theorem on Adjunctions with an Old Application</i> (abstract on p. 18)
OR	UMC 158	<b>Ed Brinksma and Joost-Pieter Katoen</b> , Universite Twente (Paper presented by R. Langerak) <i>Disjunctive Causality</i> (abstract on p. 8)
4:00 PM	UMC 157	<b>Philipp Sunderhauf</b> , University of Southern Maine <i>Representation of Quantitative Domains</i> (abstract on p. 13)
OR	UMC 158	<b>Krzysztof Worytkieswicz</b> , EPFL, Lausanne <i>Abstract Interpretation of Polymorphically Typed Languages</i> (abstract on p. 26)
4:30 PM	UMC 157	<b>Mathias Kegelmann</b> , University of Birmingham <i>Factorization Systems on Domains</i> (abstract on p. 17)
OR	UMC 158	<b>Dennis Volpano</b> , Naval Postgraduate School <i>Towards Type Systems for Secure Remote Evaluation</i> (abstract on p. 25)

(TUESDAY SCHEDULE CONTINUED ON NEXT PAGE)

**Tuesday, June 4, 1996 (continued)**

5:00 PM	UMC 157	<b>Pedro Resende</b> , Instituto Superior Tecnico, Portugal <i>Quantaes, Finite Observations and Strong Bisimulation</i> (abstract on p. 21)
	OR	
	UMC 158	<b>Robert Kim Yates</b> , Lawrence Livermore National Lab <i>Causal Continuity of Non-monotonic Processes</i> (abstract on p. 26)
7:00 PM	The Broker Inn	<b>CASH BAR (7 PM)</b> <b>CONFERENCE BANQUET (7:30 PM)</b>

**Wednesday, June 5, 1996**

8:00 AM	UMC Aspen Rooms	<b>CONTINENTAL BREAKFAST</b>
8:30 AM	UMC 157	<b>Paul Gastin</b> , LITP, Paris <i>Resource Traces: A Domain for Processes Sharing Exclusive Resources</i> (abstract on p. 14)
9:00 AM	UMC 157	<b>Kim Ritter Wagner</b> , Cambridge University <i>Variations on Fixed-Point Theorems for Semantics</i> (abstract on p. 16)
9:30 AM	UMC 157	<b>Vijay Saraswat</b> , Xerox Parc <i>Truly Concurrent Constraint Programming</i> (abstract on p. 23)
10:00 AM	UMC Aspen Rooms	<b>BREAK</b>
10:30 AM	Sibell Wolle Fine Arts N141	<b>INVITED ADDRESS</b> <b>Matthew Hennessy</b> , University of Sussex <i>A Fully Abstract Denotational Model for the Pi-Calculus</i> (abstract on p. 14)
11:30 AM	Sibell Wolle Fine Arts N141	<b>Alan Jeffrey</b> , University of Sussex <i>Linear Types for Higher-order Processes with Unique Name Generation</i> (abstract on p. 16)
12:00 NOON	UMC Aspen Rooms	<b>LUNCH</b>

(WEDNESDAY SCHEDULE CONTINUED ON NEXT PAGE)

Wednesday, June 5, 1996 (continued)

1:20 PM	Sibell Wolle Fine Arts N141	<b>INVITED ADDRESS</b> <b>Peter Freyd</b> , University of Pennsylvania <i>Paracategories, Paramathematics</i> (abstract on p. 13)
2:30 PM	UMC 157	<b>Frank Oles</b> , IBM Thomas J. Watson Research Center <i>An Application of Lattice Theory to Knowledge Representation</i> (abstract on p. 19)
	OR UMC 158	<b>Katherine St. John</b> , University of Pennsylvania <i>Recursion on Finitely Generated Structures</i> (abstract on p. 22)
3:00 PM	UMC Aspen Rooms	<b>BREAK</b>
3:30 PM	UMC 157	<b>Marta Kwiatkowska</b> , University of Birmingham <i>Fair Recursion in Synchronous CCS</i> (abstract on p. 16)
	OR UMC 158	<b>Peter Selinger</b> , University of Pennsylvania <i>Henkin Representations and Polymorphism</i> (abstract on p. 24)
4:00 PM	UMC 157	<b>Eiichi Horita</b> , NTT Communications Science Laboratories <i>Self-Interpretation in an Extension of CCS with Parametric Channels</i> (abstract on p. 15)
	OR UMC 158	<b>James Otto</b> , McGill University <i>Bicategories for Logic Programming</i> (abstract on p. 20)
4:30 PM	UMC 157	<b>Claudio Hermida</b> , McGill University <i>Simulations as Modules</i> (abstract on p. 15)
	OR UMC 158	<b>Hongde Hu</b> , Université de Quebec <i>Softness, Coherence Spaces and Free, Bicomplete Categories</i> (abstract on p. 15)
5:00 PM	UMC 157	<b>Lutz Priese</b> , Universitaet Koblenz <i>Compositional Petri Net Semantics</i> (abstract on p. 20)
	OR UMC 158	<b>David Benson</b> , Washington State University <i>Stone Duality between Queries and Data</i> (abstract on p. 8)

END OF PROGRAM

## REPORT DOCUMENTATION PAGE

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13. ABSTRACT (Maximum 200 words)  Funds under this grant were used to support three principal activities. The first was the Twelfth Workshop on the Mathematical Foundations of Programming Semantics, which took place on the campus of the University of Colorado, Boulder from June 3 to June 5, 1996. The second was a series of visits by researchers to Tulane University during the two-month period June - July, 1996, to collaborate with the Principal Investigator on topics of common research interest. These visits formed the bulk of the Workshop on Concurrency listed in the title of the grant. Lastly, funds were used to help support participants in a small workshop in New Orleans from September 15 to September 17, 1996 which focused on applications of semantic techniques to problems in security of distributed computing systems.				
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